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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/462,796	01/13/2000	TAKAYOSHI WATANABE	500.38090X00	5528
7590 07/19/2005 ANTONELLI TERRY STOUT & KRAUS 1300 NORTH SEVENTEENTH STREET SUITE 1800 ARLINGTON, VA 22209			EXAMINER NGUYEN, THANH T	
			ART UNIT 2813	PAPER NUMBER

DATE MAILED: 07/19/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

AK

Office Action Summary	Application No. 09/462,796	Applicant(s) WATANABE ET AL.	
	Examiner Thanh T. Nguyen	Art Unit 2813	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 17 July 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 34-60 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 53 is/are allowed.
- 6) ☒ Claim(s) 34-52 and 54-60 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>5/16/05</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Arguments

Applicant's arguments filed 5/16/05 have been fully considered but they are not persuasive.

Information Disclosure Statement

The information disclosure statement filed 5/16/05 fails to comply with 37 CFR 1.98(a)(2), which requires a legible copy of each cited foreign patent document; each non-patent literature publication or that portion which caused it to be listed; and all other information or that portion which caused it to be listed. It has been placed in the application file, but the information referred to therein has not been considered.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Art Unit: 2813

Claims 34-52, 54-60 are stand rejected under 35 U.S.C. 103(a) as being unpatentable over Yamaguchi et al. (U.S. Patent No. 6,271,110) in view of Akira (JP Patent No. 05-121409), Ochiai et al. (U.S. Patent No. 5,643,831) and Michihiko et al. (JP Patent No. 05206221) as previously applied.

Referring to figures 2a-2b, Yamaguchi et al. teaches a method of producing a semiconductor device comprising the steps of:

Forming a plurality of pyramidal bump electrodes (34) on the semiconductor device, and

Connecting the pyramidal bump electrodes (34) to pad electrodes (32) of the semiconductor device,

The step of forming the plurality of pyramidal bump electrodes including: a step of forming etched holes (14, called cavities, see figure 2a, col. 6, lines 60-67) by anisotropically etching base material having a crystal orientation (see col. 8, lines 37-42), and

A step of filling up the etched holes by plating a metal (see col. 9, lines 17-20) to form the pyramidal bump electrode (see figure 2B) by transferring a shape of the etched hole.

Regarding to claim 54, the plurality of pyramidal bump electrodes (34) is separated from one another at least after the step of connecting the pyramidal bump electrode (34) to pad electrode (32) of the semiconductor device (see figure 2b).

Regarding to claim 55, removing the base material (10) from the pyramidal bump electrodes after the step of connecting the pyramidal bump electrodes (34) to pad electrode (32) of the semiconductor device (see figures 2a-2b, wherein 10 is removing).

Art Unit: 2813

Regarding to claim 56, each of the pyramidal bump electrodes (34) keeps its pyramidal shape after the step of connecting pad electrodes (32) of the semiconductor device (see figure 2b).

Regarding to claim 57, each tip of the pyramidal bump electrodes (34) is bonded to a terminal (50) formed on a substrate after the step of connecting the pyramidal bump electrodes (34) to pad electrodes (32) of the semiconductor device (figure 12E-14).

Regarding to claim 58, each tip of the pyramidal bump electrodes (34) is thermally compressed to the terminal formed on the substrate (see figure 12E).

Regarding to claim 59, each tip of the pyramidal bump electrodes (34) is soldered to the terminal (52) formed on the substrate (see figure 12, and related text).

Regarding to claim 60, the terminal is provided on a wiring conductor (52) formed on a substrate (50, see figures 12E-14).

However, the reference does not teach etching a first oxidized film on the base material, removing the first oxidized film and forming a second oxidized film on the etched holes, forming a primary film of the same material as the metal for plating of the metal on the base material, and filling the metal such as gold/nickel, copper.

Akira teaches filling the opening with a copper or gold (20/26, see paragraph 21) by electroless plating.

Therefore, it would have been obvious to a person of ordinary skill in the requisite art at the time of the invention was made would fill the opening with a copper or gold by electroless plating in process of Yamaguchi et al. as taught by Akira because the process would provide excellent selectivity and adhesive strength on the film.

Art Unit: 2813

Ochiai et al. teaches a method of etching a first oxidized film on the base material, removing the first oxidized film and forming a second oxidized film on the etched holes (see figures 8A-8H and related text).

Therefore, it would have been obvious to a person of ordinary skill in the requisite art at the time of the invention was made would etch a first oxidized film on the base material, removing the first oxidized film and forming a second oxidized film on the etched holes in process of Yamaguchi et al. as taught by Ochiai et al. because the process would bring the plate into a chemically stable condition and provides a low wetability to the plate, so a durability of the plate is improve and formed solder balls can be easily transferred.

Michihiko teaches forming a primary film of the same material as the metal for plating of the metal on the base material (see page 3, paragraph#7, meeting claim 35).

Therefore, it would have been obvious to a person of ordinary skill in the requisite art at the time of the invention was made would form a primary film of the same material as the metal for plating of the metal on the base material in process or Yamaguchi et al. as taught by Michihiko because the process would prevent generation of short-circuit.

It is known in the art to form the filling metal such as gold/nickel, copper.

Therefore, it would have been obvious to a person of ordinary skill in the requisite art at the time of the invention was made would form the filling metal such as gold/nickel, copper in process of Yamaguchi et al. because process in known in the art since determining the optimum material for the layer only involved routine skill in the art.

Allowable Subject Matter

Claim 53 is allowable over the prior art.

Response to Arguments

Applicant's arguments filed on 5/16/05 have been fully considered but they are not persuasive.

Applicant contends that Yamaguchi et al. does not disclose or suggest to a step of filling up the etched holes by plating a metal to form the pyramidal bump electrodes by transferring a shape of etch hole. In response to applicant that Yamaguchi et al. clearly teaches form the bump shape by transferring the anisotropic etch hole (see figure 2B). Applicant presents a long argument of Yamaguchi reference but does not clearly present the meaning of "a step of filling up the etched holes by plating a metal to form the pyramidal bump electrodes by transferring a shape of etch hole" as claimed. Hence, there is not seen that claimed invention extinguishable from Yamaguchi's reference.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO**

Art Unit: 2813

MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thanh Nguyen whose telephone number is (571) 272-1695, or by Email via address Thanh.Nguyen@uspto.gov. The examiner can normally be reached on Monday-Thursday from 6:00AM to 3:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead, Jr., can be reached on (571) 272-1702. The fax phone number for this Group is (571) 273-8300.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (703) 308-0956 (See **MPEP 203.08**).

A handwritten signature in black ink, appearing to read 'Thanh', with a long, sweeping horizontal line extending to the right.

Thanh Nguyen
Patent Examiner
Patent Examining Group 2800